

REMARKS

Status of the Claims

Claims 1-5 are pending in the application. The Applicants have elected the invention of Group II of the outstanding restriction requirement. Thus, claims 1-3 are currently withdrawn from further consideration. Claims 4 and 5 are currently amended. Reconsideration and allowance of all of the pending claims is respectfully requested.

New matter is not being introduced into the application by way of this amendment. The amendment to claims 4 and 5 is supported at page 5, lines 16-19 of the specification. Accordingly, no new matter is added and entry of this amendment is respectfully requested.

Claim Rejections - 35 U.S.C. §112 (Section 2 of the Office Action)

Claims 4 and 5 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The Examiner asserts that the terms "average inside pore size" and "average rate of inside hole area" are unclear. For the following reasons, the applicants respectfully traverse.

At page 3, lines 3-4 of the Office Action, the Examiner questions whether the "inside" of the porous membrane is relative to the surface of the porous membrane. In fact, in this application the "inside" of the porous membrane is considered to be "inside" relative to the surface of the membrane. The Examiner's attention is directed to the specification starting at page 17, line 15. An example is there shown that illustrates the meaning of the term "inner" in the present specification. In the example, it is described that "a sample film was broken at temperatures of liquid nitrogen, and a section of the film was exposed." Accordingly, one of skill

in the art would immediately recognize that the term "inner" is understood to be relative to the surface of the porous membrane.

The Examiner also questions what is intended by the expression "(rate of) surface hole area." See Office Action, page 3, lines 4-5. The Examiner states that for purposes of present examination "hole area" is interpreted as porosity. See Office Action, page 3, line 5.

The Examiner's interpretation of "hole area" in the Office Action as equivalent to the porosity is, in one respect, correct. That is, porosity in the present specification refers to the rate of inside hole area. See Specification page 11, line 24. "Hole area" is also mentioned as "opening" at page 2, line 3 of the specification. The "rate of surface hole area" is also mentioned as "rate of hole area at the film surface" at page 12, lines 5-6. Furthermore, the description at page 10, lines 5-13 should help clarify what is meant by "hole area" and "rate of surface hole area" in the present specification:

By keeping the cast film under the above-mentioned condition, the film can have an increased rate of hole area specifically on a surface opposite to the substrate-side surface of the film (hereinafter may be referred to as "air-side surface of the film"). The rate of hole area is increased provably because water (moisture) migrates from the surface into the core of the film and efficiently accelerates the phase separation of the solution mixture by holding the cast film under a humidified condition.

Claim Rejections - 35 U.S.C. §102/§103

Claim 4 is rejected under 35 U.S.C. §102(b) as anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over, the Derwent Abstract of JP '774 (JP 48-097774). Claims 4 and 5 are rejected under 35 U.S.C. §103(a) as being unpatentable over Roy (U.S. Patent No.

3,929,971) in view of Kamide (U.S. Patent No. 3,883,626) For the following reasons, each of these rejections is respectfully traversed.

1. The Present Invention

The porous film of claim 1, as currently amended, comprises a large number of continuous micropores. The porous film of the present invention has the following properties:

- (i) a thickness of 5 to 200 μm ;
- (ii) an average surface pore size A of 0.01 to 10 μm ;
- (iii) the ratio A/B is in the range of 0.3 to 3, wherein B is an average inside pore size;
- (iv) the ratio C/D is in the range of 0.7 to 1.5, wherein C is an average rate of surface hole area, and D is an average rate of inside hole area; and
- (v) a polymer component of the film comprises at least one selected from a group of amide-imide polymers, imide polymers, amide polymers, sulfone polymers, cellulosic polymers, acrylic polymers, fluorocarbon polymers and olefinic polymers.

2. JP '774

It is well established under U.S. law that in order to find either anticipation or obviousness, the Office must first show that each and every element of the claimed invention is disclosed or suggested by the prior art. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP §2131, citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Similarly, "[T]o establish prima facie obviousness

of a claimed invention, all the claim limitations must be taught or suggested by the prior art."
MPEP §2143.03.

JP '774 discloses a porous membrane which is used to condense or purify liquids. The porous membrane disclosed in Example 1 of JP '774 has a surface pore size of 0.3 μm , an inside pore size B of 0.9 μm , and the A/B ratio is 0.33. The membrane is made of polyvinyl chloride (PVC). See **Exhibit 1**, which is a partial English translation of JP '774. Therefore JP '774 only discloses a membrane with the properties (ii) and (iii) cited above.

Nevertheless, the Examiner asserts that the JP '774 membranes inherently disclose the presently claimed C/D ratio. See page 4, lines 1-4 of the Office Action. The Examiner also asserts that JP '774 inherently discloses a porous membrane with a thickness of 0.1 μm . However, in JP '774 the layer having a thickness of 0.1 μm is not a porous membrane made of PVC, but is a substrate made of polyester woven textile.

In any case, the JP '774 membrane is made of PVC, or a vinyl chloride resin, or a vinyl chloride which are all given as examples of the polymer component in JP '774. JP '774 does not disclose or suggest using the polymer components recited in the present claims.

The present claims recite polymer components (v), which are known as materials which can be used for porous films. The polymer component (v) by a phase conversion technique, in which a mixture containing the polymeric compound is cast as a film and the film is brought to a solidifying liquid.

Accordingly, JP '774 does not disclose or suggest all of the elements of the present claims. JP '774 does not disclose or suggest a polymer component forming a porous film which

comprises an amide-imide polymer, an imide polymer, a polyethersulfone, a polysulfone, an acrylic polymer or a cellulose acetate. Therefore JP '774 cannot anticipate, or render obvious, the present claim 4. The Applicants respectfully submit that this rejection must be withdrawn.

3. Roy in view of Kamide

The applicants respectfully submit that Roy and Kamide also do not disclose or suggest the use of the polymer component as recited in currently amended claims 4 and 5. Therefore, Roy in view of Kamide also do not disclose or suggest all of the elements of the presently claimed invention. Therefore, the rejection of claims 4 and 5 over Roy in view of Kamide must now be withdrawn.

Roy discloses synthetic material which is:

- (a1) made of hydroxyapatite or whitlockite;
- (b1) produced by a process using hydrothermal chemical exchange of the carbonate skeletal material with the phosphate, i.e. hydroxyapatite or whitlockite; and
- (c1) possesses substantially the same microstructure as the original carbonate skeletal material from which it was derived (see Roy, column 3, lines 6-15 and claim 1).

The synthetic material of Roy is used as a biomaterial, specifically for bone implants, since the synthetic material of Roy is similar to human hard tissue. See Roy, column 3, lines 46-55.

Kamide discloses a porous screen membrane filter which is:

- (a2) made of cellulose acetate;

(b2) produced by a process of casting a solution of cellulose acetate in an organic solvent on a smooth solid surface into a thin film, and subjecting the film to an evaporative step for solvent removal (see claim 1).

The filter of Kamide is used as a filter element in an artificial kidney or instrument. Kamide explains that in using an artificial kidney fitted with their porous membrane filter, it is not necessary to use a circulating buffer liquid. This is in contrast to the prior art. This allows an artificial kidney to be built in a substantially reduced overall size, and is capable of being designed into a portable unit. See Kamide column 12, lines 38-46.

In the Office Action, the Examiner mentions that "the synthetic material of Roy is in the form of a flat sheet (claim 23)" and it would be obvious to "use the microporous synthetic sheet of Roy with the thickness as disclosed by Kamide, because it is known to select such thickness of microporous sheet when such sheet is used as filters." Office Action, page 5.

However, the membranes of the cited prior art use completely different materials from the presently claimed polymer component. Roy only uses phosphate (hydroxyapatite or whitlockite). The differences between the present membranes and the prior art membranes are also due to the different processes (a2) and (b2) for producing the membranes of Roy and Kamide as described above.

In addition, Roy only describes how to use a sheet with certain pore sizes (see column 3, lines 31-42). Roy contains no suggestion or motivation that would teach one of skill in the art how to make a sheet by the process of hydrothermal chemical exchange of a carbonate skeletal material with the thickness disclosed by Kamide. Therefore one of ordinary skill in the art would have no motivation or suggestion to combine the disclosures of Roy and Kamide.

On the other hand, it is known that porous films can be produced from a polymer component which comprises amide-imide polymers, imide polymers, polyethersulfones, acrylic polymers and cellulose acetate, for example, by a phase conversion technique. However, the resulting films generally have a skin layer (compact layer) on the surface, and contain substantially no hole area (opening), or contains some openings with a low rate of hole area. See specification, page 1, line 18 to page 2, line 4. These problems, or their solution, relating to films made by a polymer component are not mentioned in the cited references.

A porous film of the present invention made by a polymer component (v) has homogenous micropores with a high rate of hole area even on a surface of the film which has been in contact with a substrate. See page 2, line 21 to page 3, line 5 of the specification. This is not disclosed or suggested by the prior art.

Therefore, the prior art does not disclose or suggest all of the elements of the presently claimed invention. The applicants respectfully submit that the rejection of claims 4 and 5 over Roy in view of Kamide must be withdrawn.

CONCLUSION

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Mark Konieczny (Reg. No. 47,715) at the telephone number below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

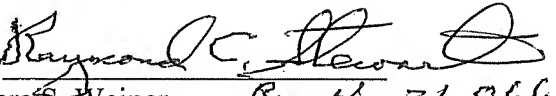
Application No. 10/534,411
Amendment dated December 8, 2006
Reply to Office Action of September 8, 2006

Docket No.: 3273-0202PUS1

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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Attachment: Exhibit 1: partial English translation of JP 48-97774



JP 48-97774 partially translated in English

2. Claims

A separation process for subjecting a flow cycling solution to condensation or purification by flow cycling liquid material to be condensed or purified to one side of the microporous body, and transferring solvents and contamination low molecular compounds in the liquid material to the other side of the microporous, and thereby yield permeate, wherein a microporous body having pores on the each surface of obverse side and reverse side smaller than inside pores is used.

page 2, upper right, lines 3 to 14

In addition, condensation processes by filtration using a membrane has been developed, wherein the membrane comprises filters made by a regenerated cellulose, a polyvinyl alcohol, vinyl acetate resin, and other resins, which are the filters being swelled on exposure to aqueous solution, and to be able to perform permeation of solvents, contamination low molecular compounds, and ions. However, the filters have less mechanical strength, are extremely expensive to provide, and have a lot of problems with stability of quality, and deteriorate chemical resistance. As stated above, the filters have a lot of failure. Furthermore, a membrane made of regenerated cellulose generally has a skin layer and a sponge layer, and we

cannot obtain an optimal permeate unless liquid material is subjected to contact with the side of the skin layer. The target permeate cannot obtain with no filtration and condensation of liquid material if the liquid material is subjected to contact with the side of the sponge layer in the wrong. Therefore, it was necessary to make the indication of being obverse or reverse.

page 3, upper right, lines 1 to 15

As the microporous body of the present invention, vinyl chloride, vinylidene chloride (trade name; nica-temp by Nippon Carbide Industries Co., Inc.), heat-resistant ABS, and other thermoplastic synthetic resin capable of dissolving in various solvent, or thermosetting resin are applicable.

In addition, other materials other than the above synthetic resin are also applicable as far as they have pores on the both surfaces smaller than inside pores. For the purpose of obtaining much purified solution, for example, flow rate is 100 to 150 l/m²·hr when a microporous made of heat-resistant poly vinyl chloride having an average pore size of 0.9 μm. The microporous bodies can be used depending on the purpose or the utilities, and the pore size may be selected from a variety of sizes between several 100 Å to 5 μm.



特 許 願

昭和 47 年 3 月 28 日

特 許 行 長 官 殿

1. 発明の名称 分離方法

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4. 添附書類の目録

(1) 明 細 書	1	通
(2) 図 面	1	通
(3) 願 書 副 本	1	通
(4) 出願審査請求書	1	通

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審査請求 有 (全4頁)

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明 細 書

1. 発明の名称 分離方法

2. 特許請求の範囲

微孔性体の片側に濃縮又は精製すべき原液を流動循環せしめて他の一方の側に溶媒、きよう雑低分子などを移行させ透過液を得ることにより、流動循環液を濃縮又は精製する分離方法に於いて、前記微孔性体として表面及裏面の微孔径が内部微孔径より小さい微孔性体を使用することを特徴とする分離方法。

3. 発明の詳細な説明

本発明は、表面及び裏面の微孔径が内部微孔径より小さい微孔性体を介して、その片側に濃縮又は精製すべき原液を流動循環せしめて他の一方の側に溶媒きよう雑低分子などを移行させ透過液を得る分離方法に関するもので、電着塗料、重金属液、染料液、その他溶液の精製又は濃縮を目的とし、浴液管理、廃液処理の新しい方法を提供するものである。

代表的な一例として浴液管理が特に要求され

る電着塗料について説明すると、一般に酸価30から300のポリカルボン酸を樹脂形成樹脂とし、このカルボン酸基1部または全部をアンモニアまたは有機アミンで中和することによりエマルジョンまたは水溶性の状態で水中に安定して存在させている。このポリカルボン酸-アミン-水の系に適当な方法で塗料を分散させ、その外に有機溶剤その他の添加剤が加えられている。電着塗料によつてアミンの1部または大部分は一般に塗料中に蓄積される。

またサビ止め前処理として被塗物は化成被膜処理工程を経て、塗料槽内に入るために化成処理液中のリン酸イオン、硫酸イオン、亜鉛イオンなどのきよう雑イオンを持ち込み、これらが蓄積して塗料の再溶解、電解気泡の増大をもたらす。塗装後の膜状態などに異常をもたらすことが知られている。この点でアミン及びきよう雑イオンを除去する液組成の管理方法が塗装膜の良否を決定するものとして重視されているわけである。

又濃縮により得られた透過液を被塗物の洗滌水

として使用し、洗滌後の液を再び浴槽にもどす方法が近年実施されてきており、塗料の濃縮は重要な問題とされている。洗滌水として使用する場合、10%程度の塗料の汚液側への損失は作業上さしつかえないとされている。前者の塗料浴組成の管理方法として従来しられている方法は、1) 陽イオン交換樹脂による方法。2) 電気透析による方法。3) 塗装の進行とともに蓄積されるアミンに対応してアミン濃度の低い塗料を補充していく方法などがある。

第1の方法は、陽イオンまたは陰イオンを、水素イオンまたは水酸イオンと交換するもので、再生剤を用いて定期的に再生する必要がある、連続換薬がしにくい。第2の方法は、イオン交換膜を介して電槽を配置し電位を与えて、イオンを電気的に移動させて、有害低分子イオンを選択的に除去する方法であるが、陰の電荷を有する高分子の塗料が交換膜表面に被膜を形成し、イオンの移動を阻害する。第3の方法では、アミン濃度の調整は可能であるが、何かのきよう雑イオンの調整は

できず補給時期は不連続であり塗料粘度が高く作業性が悪い欠点がある。

又再生セルローズ、ポリビニルアルコール、酢酸ビニル樹脂フィルムなどの如き水溶液中で膨潤することによりきよ雑低分子やイオンの透過が可能になる様な膜による汚過の濃縮方法が開発されているが、これらは機械的強度弱く、コストが極めて高く且つ品質の安定性についても多くの問題を有し、耐薬品性に劣るという多くの欠点を有していた。更に再生セルローズによるメンブレンは、一般的にはスキン層とスポンジ層とがあつて、スキン層側から原液を接触せしめないと最適な透過液を得ることが出来ず、間違つてスポンジ層から原液を接触せしめると、原液の汚過、濃縮が行われず、目標の透過液が得られないことから表裏の表示を明確にする必要があつた。

又湿潤状態保存という煩雑な手数を必要とし、乾燥による保存中の変質も留意しなければならず、多くの問題及び欠点を有していた。

本発明は上記の欠点を除去し、イオン交換膜法

電気透析法などの如く多額の投資を必要とする方法を用いず、機械的強度ある微孔性体を使用して濃縮又は精製する分離方法を提供する。

本発明に用いる微孔性体は、内部微孔径より表面及び裏面の微孔径が小さいものを使用することによつて、裏面の表示の必要なくしたがつて間違つて取扱うこともない。樹脂を構造物として意識的に微孔を形成せしめた合成樹脂よりなるためたえず湿潤状態に置いておく必要もないことなどの利点があり、該微孔性体の一方に濃縮又は精製する電着塗料など原液を圧力及び流速が自由にコントロール出来る様にして流動循環せしめ、他の一方の側にきよ雑低分子などを移行せしめて分離するものである。

以下に本発明の各実施例を示す。

実施例

ポリ塩化ビニルを溶剤に溶解し、後非溶剤を添加してなる合成樹脂溶液をポリエステル不織布0.1mmに附層乾燥して得られたものは、表面及び裏面の微孔径が0.3(μ)内部の微孔径が0.9(μ)

の微孔性体であつた。

この微孔性体を介して一方に濃縮又は精製すべき電着塗料を圧力3kg/cm²、流速3m/secで流動循環せしめたところ、他の側に50g/m²hrの透過精製液を得た。

原液及び透過液を分析によつて本発明の方法と従来の方法(セルローズ系膜を用いたもの)とで比較したところ表-1の通りであつた。

本実施例によると、適度なきよ雑イオンの除去を行い、高分子だけは原液にとどめ、精製液流出率も従来法に比べて大きく、長寿命、耐薬品性で、且つコストは従来品の1/10と安価であり、極めて良好な結果を得た。また本実施例によつて得られた電着塗料を被塗物に塗布した塗膜については、表-2で示すような結果で本発明によるものは、異常附層がなくなつたり大きな破壊電圧にも耐えることができる。

表-1 精製液の比較

	原 液	本発明による精製液	従来法による精製液
Na	82	30	28
K	45	10	11
Ca	60	5	3
Cr	100	40	60
Zn	20	—	—
不揮発分(%)	14	0.3	0.5
全アミン量(%)	30	10	8
PH	7.8	7.9	7.9
精製液流出率($l/m^2 \cdot hr$)		50	40~50

表-2 膜の比較

	原 液	本発明による 20%濃縮液	従来法による 20%濃縮液
不揮発分(%)	14	12	11
破壊電圧(V)	360	400	380
異常附着性	不良	良	やや良
	粒状の附着 認められる	(粒なし)	(わずかに) (粒あり)

液を得る。

装置としては、微孔性体の平板積重ねによる方法、チューブ状にする方法など面積を増加させるとともに必要なところに乱流を生ぜしめるような構造をとると、更に精製液を増加できる。しかし本発明は特にこれらに限定されるものではない。

本発明に用いる微孔性体の特徴は、原液流動循環の圧力を0~10 kg/cm^2 と変化せしめると必ずしも圧力に比例した透過液が得られるというのではなく、ある圧力から徐々に飽和してくるカーブが得られ、また圧力を固定して膜表面での流速を変えると同様に透過液量が飽和するカーブが得られ、それぞれの圧力、流速、微孔形、微孔径の最適値を選択することができる。従つて電着塗料の濃度などにより微孔孔径を数100Å~5 μ の間で任意に調整して使用すると最適である。

上述する如く、本発明による一実施例である電着塗料の分離方法は、分離したきより難イオ

本発明の微孔性体としては、合成樹脂には実施例に示す以外に塩化ビニル、塩化ビニリデンコポリマー、耐熱ポリ塩化ビニル、(商品名日本カーバイド社ニカテンブ)耐熱ABS、などのあらゆる溶剤に可溶な熱可塑性合成樹脂あるいはポリカーボネートなどの熱硬化性樹脂が適用出来る。

又上記合成樹脂以外の材質でも内部孔径より表面孔径が小さいものであれば適用できる。精製液を多く得る場合には、例えば耐熱ポリ塩化ビニルを使用して平均孔径0.9 μ の微孔性体を用いると、100~150 ($l/m^2 \cdot hr$)の流出量となる。微孔性体はその目的、用途に応じて孔径を数100Å~5 μ の間で変化せしめて選択すれば良い。

本発明一実施例の基礎的フローシートを図に示すと、1は電着塗料原液タンク、2は循環ポンプ、3は濃縮本体部、4は微孔性体、5は精製液であり、電着塗料を原液タンクから循環ポンプによつて循環せしめ微孔性体を介して精製

ンを含む精製液を塗装浴より除去することによる浴組成の向上の目的と該精製の一部又は全部を被塗物に附着した塗料の洗滌液として使用し再び槽内にもどす塗料回収の目的の二つに利用することが出来、かつ従来にない低価格の装置及び維持費で実施できるとともに良好な電着塗料を得ることができるといふ工業的価値大なるものである。

4 図面の簡単な説明

図は本発明一実施例の基礎的フローシートである。

- 1…電着塗料原液タンク 2…循環ポンプ
3…濃縮本体部 4…微孔性体 5…分離精製液。

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